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(71)出願人　000005821
松下電器産業株式会社
大阪府門真市大字門真1006番地
(72)発明者　粟屋　加寿子
大阪府門真市大字門真1006番地　松下電器産業株式会社内
(72)発明者　黒木　洋一
大阪府門真市大字門真1006番地　松下電器産業株式会社内
(74)代理人　100097445
弁理士　岩橋　文雄　（外２名）

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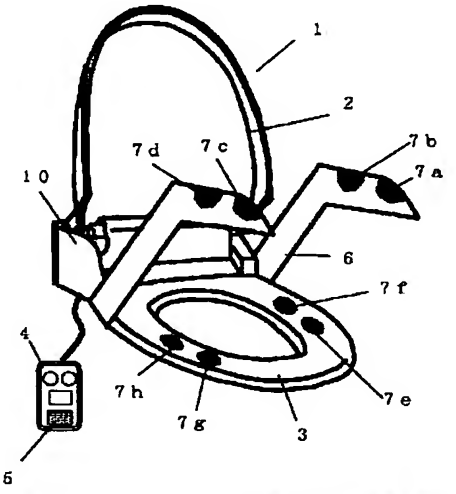
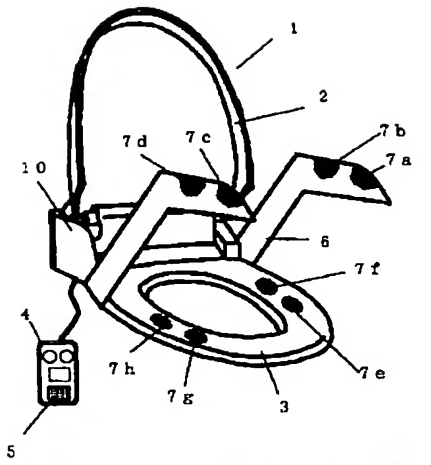
(54)【発明の名称】　体脂肪測定機能付き便座装置

(57)【要約】
【課題】　従来の体脂肪計は、内臓脂肪のインピーダンスが測定できない、また、データの蓄積が実行できないという課題を有している。
【解決手段】　便座３及び手すり部６に設けた電極７ａ～７ｈによって大腿部間の生体インピーダンスを測定するようにして内臓脂肪のインピーダンスを測定し、このインピーダンスと操作手段に入力された情報とから体脂肪値とカロリー消費量の時間的な経過と、現在の体脂肪値に対してカロリー消費量が十分であるかどうかを表示する体脂肪測定機能付き便座装置としている。



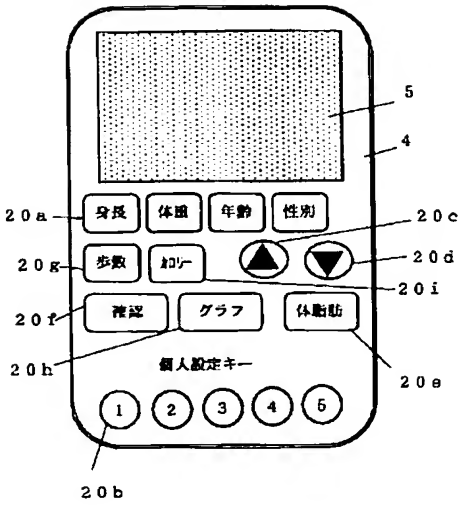
1	本体	7ｂ	電位測定用左手すり電極
2	便ふた	7ｃ	電流印加用右手すり電極
3	便座	7ｄ	電位測定用右手すり電極
4	操作手段	7ｅ	電流印加用左大腿部電極
5	表示手段	7ｆ	電位測定用左大腿部電極
6	手すり部	7ｇ	電流印加用右大腿部電極
7ａ	電流印加用左手すり電極	7ｈ	電位測定用右大腿部電極
		10	本体部

【図１】



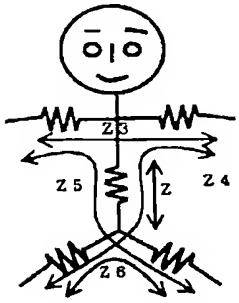
1	本体	7b	電位測定用左手すり電極
2	便ふた	7c	電流印加用右手すり電極
3	便座	7d	電位測定用右手すり電極
4	操作手段	7e	電流印加用左大腿部電極
5	表示手段	7f	電位測定用左大腿部電極
6	手すり部	7g	電流印加用右大腿部電極
7a	電流印加用左手すり電極	7h	電位測定用右大腿部電極
		10	本体部

【図２】

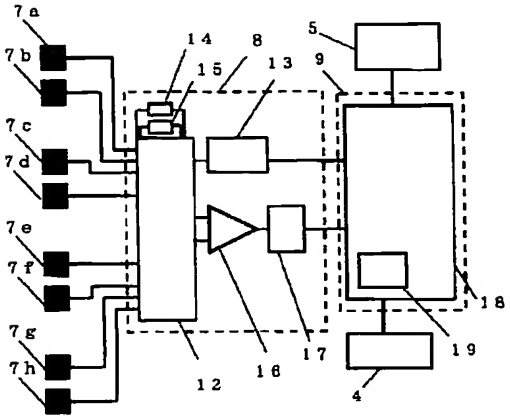


4	操作手段	20e	体脂肪測定用キー
5	表示手段	20f	確認キー
20a	入力キー	20g	歩数キー
20b	個人設定キー	20h	グラフキー
20c	前進キー	20i	カロリーキー
20d	後退キー		

【図５】

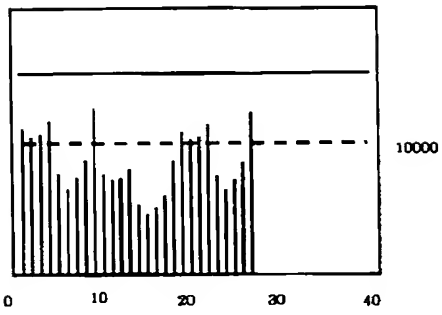


【図３】

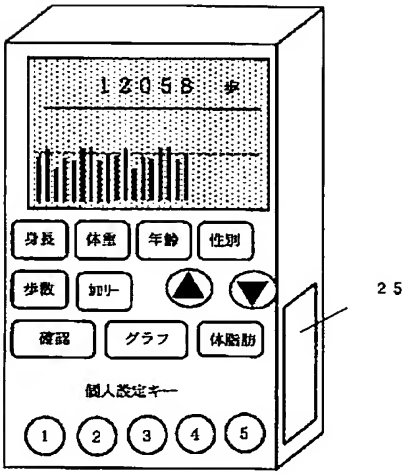


4	操作手段	8	抵抗値計測手段
5	表示手段	9	演算手段
7a	電流印加用左手すり電極	12	電極切替部
7b	電位測定用左手すり電極	13	定電流発生回路
7c	電流印加用右手すり電極	14	基準抵抗R1
7d	電位測定用右手すり電極	15	基準抵抗R2
7e	電流印加用左臀部電極	16	差分回路
7f	電位測定用左臀部電極	17	A／Dコンバータ
7g	電流印加用右臀部電極	18	マイコン
7h	電位測定用右臀部電極	19	メモリ

【図４】

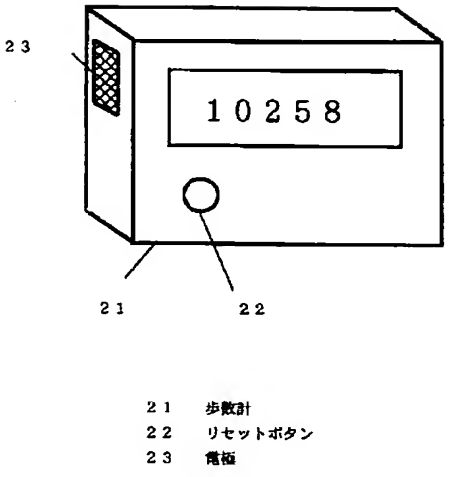


【図６】



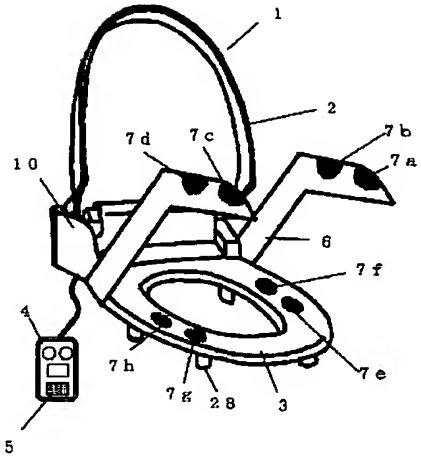
２５　読み取り部

【図７】



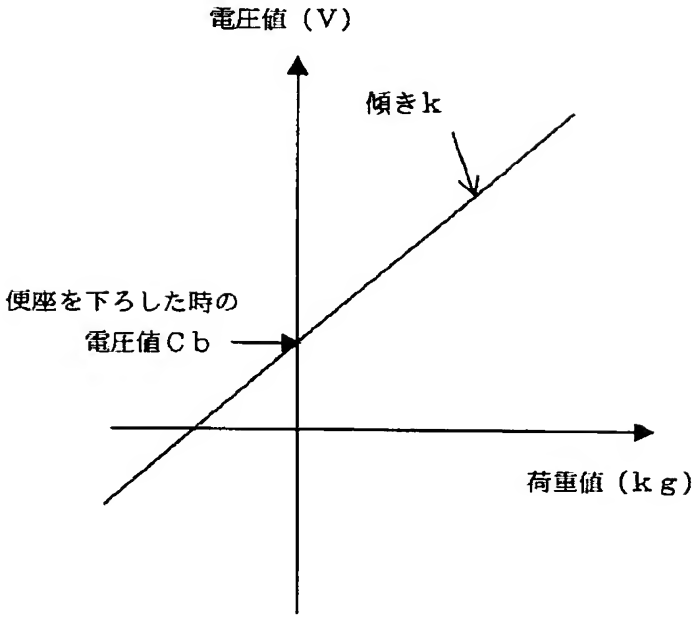
２１　歩数計
２２　リセットボタン
２３　電極

【図８】

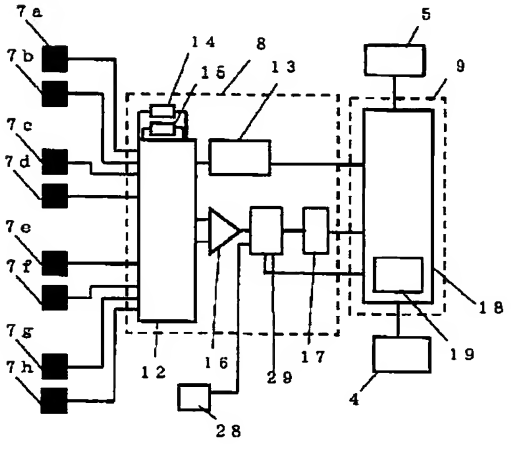


３　便座
２８　圧力センサ

【図９】

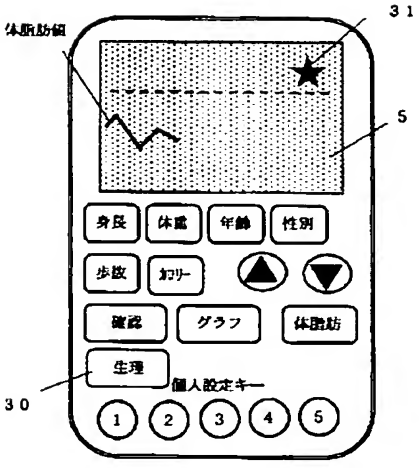


【図１０】



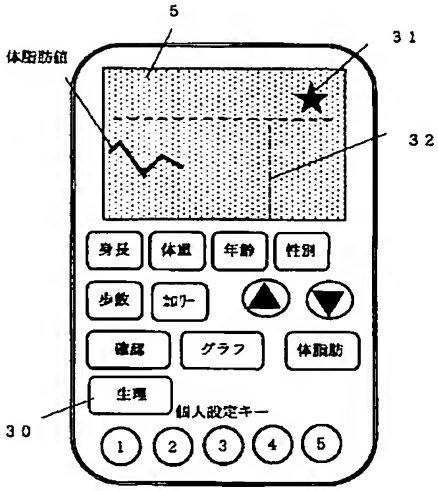
２８　圧力センサ
２９　体重体脂肪出力切替部

【図１１】



5　表示手段
30　生理日開始入力キー
31　ダイエットマーク

【図１２】



5　表示手段
30　生理日開始入力キー
31　ダイエットマーク
32　次回生理予定日表示線

フロントページの続き

(72)発明者　河本　恭宏
大阪府門真市大字門真1006番地　松下電器産業株式会社内

(72)発明者　乾　弘文
大阪府門真市大字門真1006番地　松下電器産業株式会社内

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4C027 AA06 EE00

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1]Two or more electrodes provided in a toilet seat and a handrail part, and a resistance measurement means which sends current through inter-electrode [said] and measures inter-electrode resistance, A control means which inputs weight, height, age, sex, and a step numerical value of a pedometer, and a displaying means which displays a measurement result, A seat device with a body fat measurement function provided with a calculating means which calculates a body fat value and a consumed calorie and displays time progress of said operation value on said displaying means from information on said resistance measurement means and a control means.
[Claim 2]A seat device with a body fat measurement function which indicated a control means to claim 1 provided with a reading part which reads counted value of a pedometer.
[Claim 3]A seat device with a body fat measurement function which indicated a control means to claim 1 or 2 provided with a live part which charges a pedometer.
[Claim 4]A seat device with a body fat measurement function indicated in any 1 paragraph of claims 1-3 which a toilet seat will be provided with a pressure detection means to generate a voltage signal if a pressure is detected, and use said pressure detection means as the scale.
[Claim 5]A seat device with a body fat measurement function for which an input of a physiology opening day of a control means was completed, and it indicated that a calculating means was the optimal period for a diet in any 1 paragraph of claims 1-4 displayed on a displaying means.
[Claim 6]A seat device with a body fat measurement function indicated to claim 5 as which a calculating means displays the next physiology scheduled day on a displaying means.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention]This invention relates to the seat device which can measure body fat.
[0002]
[Description of the Prior Art]The conventional body-fat scale has composition which served as the scale, equipped with the electrode the position which places a leg, sent weak current through inter-electrode simultaneously with measurement of body weight, asked for body impedance, and has measured body fat from weight and the value of body impedance. There is also a thing of composition of measuring body fat like the above by grasping the polar zone with both hands.
[0003]
[Problem(s) to be Solved by the Invention]Moreover said conventional body-fat scale cannot measure impedance of visceral fat, it has the technical problem that accumulation of data cannot be performed.
[0004]That is, in measurement of the impedance between hand-time and effort or a leg-leg, the impedance of visceral fat cannot be measured as described above. The impedance of visceral fat changes easily directly with regards to obesity. Since data is not stored, it remains in the check of being temporary obesity.
[0005]
[Means for Solving the Problem]By an electrode provided in a toilet seat and a handrail part, as this invention measures body impedance between femoral regions, it measures impedance of visceral fat, It is considered as a seat device with a body fat measurement function which displays time progress of a body fat value and a consumed calorie from information inputted into this impedance and control means.
[0006]

[Embodiment of the Invention]By the electrode provided in the toilet seat and the handrail part, as the invention indicated to claim 1 measures the body impedance between femoral regions, it measures the impedance of visceral fat, It is being used as the seat device with a body fat measurement function to display with a body fat value and time progress of calorie consumption whether for calorie consumption to be enough from the information inputted into this impedance and control means to the present body fat value.
[0007]The control means is provided with the reading part which reads the counted value of a pedometer, reads the counted value of a pedometer only by inserting a pedometer, and the invention indicated to claim 2 is using it as the seat device with a body fat measurement function it is made to be possible [whose data display].
[0008]A control means is provided with the live part which charges a pedometer, and the invention indicated to claim 3 is using it as the user-friendly seat device with a body fat measurement function which can prevent the dead battery of a pedometer.
[0009]A toilet seat will be provided with a pressure detection means to generate a voltage signal if a pressure is detected, and it can carry out the automatic meter reading of the weight on that spot, and the invention indicated to claim 4 is using it as the seat device with a body fat measurement function which can calculate an exact body fat value.
[0010]The invention indicated to claim 5 is taken as the seat device with a body fat measurement function with which it can also display a period suitable for a diet simultaneously as a calculating means calculates the optimal period for a diet from the data of a physiology opening day inputted into the control means and makes it display on a displaying means.
[0011]The invention indicated to claim 6 is taken as the seat device with a body fat measurement function with which it can also display the next physiology scheduled day simultaneously as a calculating means calculates the next physiology scheduled day from the data of a physiology opening day inputted into the control means and makes it display on a displaying means.
[0012]
[Example](Example 1) The 1st example of this invention is described below. Drawing 1 is a perspective view showing the composition of this example. The main part 1 and the control means 4 constitute the body fat measurement constant seat device with a function of this example. The main part 1 is provided with the toilet lid 2, the toilet seat 3, the handrail part 6, and the body part 10. Two or more electrodes 7a-7h are formed in said toilet seat 2 and the handrail part 6. Similarly the electrode 7a has prepared the left-hand manual pickpocket the left-hand pickpocket electrode for current impression and the electrode 7b which have been prepared for the left-hand manual pickpocket who constitutes the handrail part 6 by the left-hand pickpocket electrode for potential measurement. The electrode 7c is a right-hand pickpocket electrode for current impression, and, similarly is prepared for the right-hand

manual pickpocket. 7 d of electrodes are right-hand pickpocket electrodes for potential measurement, and, similarly are prepared for the right-hand manual pickpocket. The electrode 7e is a left femoral region electrode for impressing current to a femoral region or a hip, and is provided in the left-hand side of the toilet seat 3. 7 f of electrodes are left femoral region electrodes for potential measurement, and, similarly are provided in the left-hand side of the toilet seat 3. 7 g of electrodes are right femoral region electrodes for current impression, and are provided in the right-hand side of the toilet seat 3. 7 h of electrodes are right femoral region electrodes for potential measurement, and are provided in the right-hand side of the toilet seat 3. The heater for the body part 10 to manufacture warm water inside and the microcomputer (henceforth a microcomputer) for directing a washing start etc. are accommodated. The facilities lid 2 can be taken up and down now if needed. The handrail part 6 is an auxiliary means for sitting down easily, when raising the toilet lid 2 and sitting down on the toilet seat 3.

[0013]The control means 4 has the appearance shown in drawing 2. That is, it has the backspace key 20d and the displaying means 5 which displays a measurement result and to display as well as the input key 20a which inputs weight, height, age, sex, and the step numerical value of a pedometer, the individual set key 20b for carrying out setting out according to individual, and FWD key 20c which performs graph operation.

[0014]The information set as said input key 20a, the individual set key 20b, FWD key 20c, and the backspace key 20d is transmitted to the microcomputer 18 built in said body part 10. The resistance measurement means which measures resistance from the current which the microcomputer 18 supplies voltage in said electrode 7a-7h, and flows into inter-electrode, A body fat value and calorie consumption were calculated from said resistance measurement means, said input key 20a, and the information that was inputted by the individual set key 20b, or was set up, and it has the calculating means which displays time progress of an operation value on the displaying means 5.

[0015]Drawing 3 is a block diagram explaining the composition of said calculating means and a resistance measurement means. The electrode changeover section 12, the constant current generation circuit 13, the difference circuit 16, and A/D converter 17 constitute the resistance measurement means 8. The electrode changeover section 12 has a function which switches the electrode for current impression, and the electrode for potential measurement. The constant current generation circuit 13 has the function to send fixed current through each electrode for current impression. The difference circuit 16 has a function which outputs the signal equivalent to the potential difference of the voltage supplied to the positive electrode, and the voltage supplied to the negative terminal. Since the constant current generation circuit 13 is made into the current source at this time as described above, said potential difference is decided by impedance of a human body, and the difference circuit 16 acts after all so that the impedance of a human body may be measured. A/D converter 17 is connected to the output of

said difference circuit 16.
The A/D conversion of the measured value which shows the impedance of a human body is carried out, and it is outputting to the microcomputer 18.
The reference resistance 14 and the reference resistance 15 are connected to the electrode changeover section 12. The reference resistance 14 and the reference resistance 15 have a function in which said current regulator circuit 13 proofreads the quantity changed under the influence of ambient air temperature or disturbance.
[0016]The microcomputer 18 and the memory 19 constitute the calculating means 9. The microcomputer 18 calculates body fat from the signal which shows the impedance of the human body which is an output of said resistance measurement means 8, and has the calorie consumption for returning said body fat to a different standard value for every sex from age and weight as a control program.
[0017](Table 1) shows the relation of the impedance of a human body and amount of body fat which artificers investigated.
[0018]
[Table 1]

性別	定 数	１０～１６才	１７才	１８～６０才
男性	Ｋ１	−30.0878	−22.5104	−14.2452
	Ｋ２	0.4432	0.3766	0.29999
	Ｋ３	24.8318	24.5418	19.2507
	Ｋ４	0.0008447	0.0008208	0.0008184
	Ｋ５	0	0	−0.08941
女性	Ｋ１	−12.1173	−9.9727	−0.61143
	Ｋ２	0.34953	0.30037	0.25065
	Ｋ３	13.5013	10.9716	8.4344
	Ｋ４	0.0006947	0.0006919	0.0006897
	Ｋ５	0	0	−0.06741

注：定数 Ｋ１は切片に対するもの
Ｋ２は体重（ｋｇ）に対するもの
Ｋ３はインピーダンスに対するもの
Ｋ４は身長（ｃｍ）×身長（ｃｍ）／インピーダンスに対するもの
Ｋ５は年齢に対するもの

[0019]this (Table 1) -- the shown coefficient K1, K2, K3, K4, and K5 are determined by sex, age, weight, and height. Amount of body fat uses the coefficient K1, K2, K3, K4, and K5, and is calculated by the formula shown in (several 1) and (several 2).
[0020]
Fat-free-mass =K1+K2xW+K3xZ+K4xLxL/Z+K5xA W: Weight, L:height, Z:impedance, A:age

(several 1)
Amount of body fat = weight-fat-free mass (several 2)
Hereafter, operation of this example is explained. He sits down the handrail part 6 on the toilet seat 3 using assistance, a user opening the toilet lid 2 and taking down handrail part 6 **, and performs elimination action. If it sits down on the toilet seat 3, a user's hip or femoral region will contact the electrode 7e, 7 f of electrodes, 7 g of electrodes, and 7 h of electrodes. A user's both arms contact the electrode 7a, the electrode 7b, the electrode 7c, and 7 d of electrodes. If the body fat key 20e provided in the control means 4 is pressed at the time of this elimination action, the microcomputer 18 will start the measuring work of a body fat percentage.
[0021]That is, the square wave pulses whose microcomputer 18 is 50 kHz are outputted, the constant current generation circuit 13 acts, these square wave pulses are made into a sine wave by passing a filter, and the 50-kHz constant current of 800uA is generated. It is determined through which electrode whose electrode switching parts 12 are the electrodes 7a-7h the signal of the microcomputer 18 is transmitted to the electrode switching part 12, and sends current. While uses the four probe method which contact resistance can disregard, and measurement of impedance inter-electrode [each] sends current through an electrode, and measures the potential of another [which is said electrode and a pair] electrode. Inputting the inter-electrode potential of each set into the difference circuit 16, the difference circuit 16 searches for the inter-electrode potential difference V. The signal which shows this potential difference V is changed into a digital signal by A/D converter 17, and is transmitted to the microcomputer 18. The microcomputer 18 asks for inter-electrode impedance, i.e., the impedance of a human body, with said digital signal.
[0022]Impedance at this time Although it asks as Z=I/V (I: constant current, V:potential difference), since the constant current I is what receives the influence by temperature, etc., it is asking for Z by this example using the formula shown in (several 3).
[0023]
Z=KixT+Ko (Ki: a constant, Ko:constant) Said (several 3) Ki and Ko have stable resistance, and are calculated using the reference resistance R1 (14) and the reference resistance R2 (15) which are known. In this way, at this example, it is asking for the impedance Z by the formula shown in (several 4).
[0024]
Z=(R1-R2) (/(V1-V2)) x(V1xR2-V2xR1)/(V1-V2) (several 4)
Next, an operation of the electrode switching part 12 is explained. There are six kinds of measuring modes of the electrode 7a - 7 h of electrodes. That is, as for the mode 2, as for the mode 4, the mode 6 of the mode 5 is [the mode 1 / the mode 3] between right hip-left hips between left-hand-right hips between right-hand-left hips between right-hand-left hands between the reference resistance R2 between the reference resistance R1. The

microcomputer 18 sends a signal to the electrode switching part 12, switches said six kinds of measuring modes in order at intervals of 100 ms, and measures inter-electrode impedance.
[0025]If measured impedance in Z5 and the mode 6 is set to Z6, the impedance Z of idiosoma will be called [measured impedance / in Z3 and the mode 4 / measured impedance / in Z4 and the mode 5] for in the measured impedance in the mode 3 by the formula shown in (several 5), as shown in drawing 5.
[0026]
Z=(Z4+Z5-Z3-Z6) /2 (several 5)
The impedance Z shown in (several 5) is the same as the impedance Z shown in (several 1). It is the impedance of the visceral fat which changes easily directly with regards to obesity.

[0027]In this way, it computes a body fat percentage by the microcomputer 18 calculating amount of body fat based on the above (several 1) and (several 2), and **(ing) this amount of body fat in weight. At this time, a user uses the control means 4 and is doing the data input of his sex, weight, height, and the age. This data input is performed as follows. First, the individual set key 20b of the control means 4 is pressed at the time of initial setting, and the personal number 1 is set up. The personal number 1 is displayed on the displaying means 5. Subsequently, a push on the height key 20a of the control means 4 will display the default value of height, for example, 160 etc., on the displaying means 5. This default value is adjusted using Shift key 20c or 20d. Shift key 20c or 20d can be fluctuated every [1], whenever it pushes once. In this way, after ending adjustment, it will be registered if 20 f of the confirmation keys are pressed. Weight, age, and sex are registered similarly. In this way, each registered data is called only by pressing the individual set key 20b.
[0028]If a user sits down on the toilet seat 3 and presses the key 20e for body fat measurement of the control means 4 as described above, it will go into a measurement start state. If the waiting time for about 2 seconds passes, a 50-kHz pulse is outputted from the microcomputer 18, current will begin to flow into the selected electrode for current impression from an electrode, and measurement will be started. 1 time of data incorporation time is 400 ms, and after incorporating 10 times, it averages and displays the data of five back. The computed body fat value is memorized by the memory 19. This example is estimating whether a user's quantity of motion is enough at this time. The pedometer is performing evaluation of this quantity of motion. At the time of setting out of said height, weight, etc., 20 g of the number-of-steps keys of the control means 4 are pressed, and Shift key 20c or 20d is used like the above, a default of the step numerical value displayed on the displaying means 5, for example, 10000 steps, is adjusted, and 20 f of confirmation keys are pressed and registered.
[0029]If 20 g of the number-of-steps keys and the graph key 20h are pressed simultaneously, the number-of-steps graph of 40 batches as shown in drawing 4 will be displayed on the

displaying means 5. The dot display is carried out to the graph on the line of 10000 steps. The reset key which is not illustrated is pressed to reset a graph. Unless this reset key is pressed, if data is updated and 40 times is exceeded, it is eliminated from left end data. If it inputs once per day, the result for about one month can see at a glance in a graph. A user's push of the calorie key 20i will display the newest calorie consumption. Calorie consumption is determined on the table inputted beforehand in the microcomputer 18.
A weight value and the number of steps are determined.
That is, if calorie consumption is about 300 kg-cal and it is based on this with the quantity of motion of 10000 steps per day, a user's calorie consumption can be determined.
[0030]In order to decrease the amount of body fat of a human body by 100g, it also turns out that the calorie consumption of 700 kg-cal is needed. Therefore, when the microcomputer of this example returns a user's amount of body fat to a standard value, it can recognize required calorie consumption and can also make a judgment whether a user's present quantity of motion is enough to this.
[0031]Two or more electrodes 7a-7h which were provided in the toilet seat 3 and the handrail part 6 as mentioned above according to this example, The resistance measurement means 8 which sends current through inter-electrode [said] and measures inter-electrode resistance, The control means 4 which inputs weight, height, age, sex, and the step numerical value of a pedometer, As composition provided with the calculating means 9 which calculates a body fat value and a consumed calorie and displays time progress of said operation value on said displaying means 5 from the information on the displaying means 5 which displays a measurement result, and said resistance measurement means 8 and the control means 4, The seat device with a body fat measurement function which can display whether calorie consumption is enough to the present body fat value as a body fat value and time progress of calorie consumption is realized from the information inputted into the impedance and the control means 4 of the measured visceral fat.
[0032](Example 2) The 2nd example of this invention is described continuously. Drawing 6 is a perspective view showing the composition of the control means 4 currently used for the seat device with a body fat measurement function of this example. The control means 4 is provided with the reading part 25 which reads the counted value of a pedometer in this example. Drawing 7 is a perspective view showing the composition of the pedometer currently used by this example. The pedometer 21 currently used by this example is provided with the reset button 22 and the electrode 23.
[0033]If a user accommodates the used pedometer 21 in the reading part 25 of the control means 4, the electrode provided in the reading part 25 will contact the electrode 23 of the pedometer 21, and will read the counted value 10258 of the pedometer 21. The control means 4 memorizes this read value in the memory 19. After ending data reading, the control means 4

displays that data reading was completed on the displaying means 5.
[0034]According to this example, as mentioned above as composition which the control means 4 is provided with the reading part 25 which reads the counted value of a pedometer, and reads the counted value of a pedometer only by inserting a pedometer and whose data display is possible, The seat device with a body fat measurement function with the sufficient user-friendliness which can read the data of a pedometer automatically is realized.
[0035](Example 3) The 3rd example of this invention is described continuously. In this example, it has the cell for charge in the reading part 25 currently explained in Example 2. If a user accommodates the pedometer 21 shown in drawing 7 in the reading part 25 with the above composition, the control means 4 will detect the residue of the cell of the pedometer 21 with the microcomputer 18 like Example 2 at the same time it reads the data of the pedometer 21 automatically. When the residue at this time has become below in the predetermined value, it charges through the electrode 23 by the built-in cell for charge.
[0036]As mentioned above, according to this example, the control means 4 reads the counted value of the pedometer 21 automatically, and the pedometer 21 could also be charged and the user-friendly seat device with a body fat measurement function which can prevent the dead battery of a pedometer is realized. Since automatic feed of the electric power is carried out to a number-of-steps counting means while performing **, it can prevent forgetting a dead battery.
[0037](Example 4) The 4th example of this invention is described continuously. Drawing 8 is a perspective view showing the composition of this example. In this example, the pressure sensor 28 is formed in the toilet seat 3. In this example, four strain gages are used as the pressure sensor 28. A strain gage generates the voltage signal which is impressed or changes linearly to a pile as shown in drawing 9. Therefore, the pressure sensor 28 will generate voltage as shown in drawing 9, if a user sits down on the toilet seat 3.
[0038]For this reason, according to this example, a user's weight can also be measured automatically. In using said pressure sensor 28 as the scale by this example, the accuracy of measurement of body weight is **200 g which is 100 kg of maximum load [0.2% of]. Drawing 10 is a block diagram showing the composition of this example. The signal of said pressure sensor 28 is inputted into the microcomputer 18 which is switched by the weight body fat switching part 29, is changed into a digital signal by A/D converter 17, and constitutes the calculating means 9. The microcomputer 18 has memorized the pressure value at the time of a zero adjust, the past weight value, etc. in the memory 19. The microcomputer 18 measured the output when the four pressure sensors 28 took down the toilet seat 3 if needed, and has memorized this value as the offset value Cb. The offset value Cb is a size of the voltage which the pressure sensor 27 outputs, when it is 0 load, and weight can measure it correctly by reducing this Cb at the time of measurement of body weight. The microcomputer 18 has memorized the inclination k shown in drawing 9 in the memory 19. In this example, the

microcomputer 18 is computing weight based on the weight conversion type shown in (several 6) from the voltage signal received from the pressure sensor 27 using said inclination k and Cb.

[0039]

Weight value W = k and (V-Cb) (however, V shows a pressure value) (several 6)

The computing equation shown in (several 6) is a case where the number of the pressure sensors 27 is one, and four cases are shown in (several 7).

[0040]

Weight value $W=k1_{and}(V1-Cb1) + \ldots k2_{and}(V2-Cb2) + \ldots kn\cdot(Vn-Cbn)$ (n= 4) (several 7)

The microcomputer 18 is performing the zero adjust in this state at this example, if the toilet lid 2 is raised in the state of a power turn.

[0041]Operation of this example is explained below. A user raises the facilities lid 2 in the state of a power turn, and takes down the toilet seat 3, and measurement will be started, if it sits down on the toilet seat 3, a defecation posture is taken and a measurement start is directed by the control means 4 as shown in drawing 2. Namely, the four pressure sensors 27 accommodated in the toilet seat 3 detect the load according to the user's weight, and transmit it to the calculating means 8. A user raises both legs and it is made to spend for a whole pile to the toilet seat 3 at this time. The microcomputer 18 is monitoring the load value every hundreds of ms.

Measurement is started only when the load beyond a certain predetermined value is applied. This measurement converts the signal of the pressure sensor 27 into a weight value using the above (several 7). The inclination k at this time is set as the memory 19 at the time of adjustment, and after one [the offset value Cb / a power supply], it is made into the pressure value immediately after taking down the toilet seat 3 before load is added, and is memorized by the memory 6c. The microcomputer 18 is calculating the load value every hundreds of ms, as described above, when this measurement becomes prescribed frequency, it calculates average value and change, it judges that it was stabilized when this change was less than the specified quantity, and is displayed on the displaying means 5 by making the average value at this time into a weight value. In this example, by measuring weight 3 times every 100 ms, if the change at this time is less than 200g, it is considered that it is stable. The accuracy of one strain gage which constitutes the pressure sensor 27 currently used by this example has become in mV and 2.5g /in the value after signal amplification. In the body fat calculating means 8, a body fat value is computed using said weight value, and it displays on the displaying means 5.

[0042]As mentioned above, according to this example, the automatic meter reading of the weight can be carried out on that spot, therefore an exact body fat value can be calculated.

[0043](Example 5) The 5th example of this invention is described below. Drawing 11 is an

outline view showing the composition of the control means 4 currently used by this example. In this example, it has the physiology opening day input key 30 inputted on a physiology opening day. Generally female basal body temperature draws two phases of a cryogenic period and an altithermal at a round term (the 28th to 32nd) from a physiology start to a next physiology start. The body temperature difference of this cryogenic period and an altithermal is about 0.4 **. Since it has hit at the stage of ovulation and metabolism becomes active, the stage to shift to an altithermal from a cryogenic period is the optimal period for a diet that a fat burns easily. Conversely, if it enters an altithermal, metabolism worsens, a fat cannot burn easily and it is said that it is hard to come out of the effect of a diet. Whenever it checks an arrangement start, the microcomputer 18 calculates the stage of said ovulation, i.e., the optimal period for a diet, and he is trying to display on the displaying means 5 as the diet mark 31 by pressing the arrangement opening day input key 30 in this example. Calculation of this optimal stage applies the menstrual period of the average for the past three months on the newest physiology opening day, considers what subtracted 12 to be an ovulation stage, and makes the optimal stage the period to the one-week forward of that day.

[0044]Since there is a possibility of injuring health when you go on a diet by straining oneself except said optimal period, a user had better go on a diet at a stage suitable for a diet.

[0045]According to this example, the heated toilet seat in which a user can go on a diet efficiently by a body fat value and calorie consumption, and the data management of a menstrual period is realized as mentioned above.

[0046](Example 6) The 6th example of this invention is described continuously. Drawing 12 is an outline view showing the composition of the control means 4 currently used by this example. In this example, the date pilot wire 32 of a scheduled physiology start is displayed the next time which is provided with the physiology opening day input key 30 inputted on a physiology opening day like Example 5, and shows a next physiology opening day to the displaying means 5. In this example, the date pilot wire 32 of a scheduled physiology start is displayed the next time which asks for a menstrual period from the stored data, expects a next physiology opening day, and shows a next physiology opening day to the displaying means 5 in a user inputting a physiology opening day on a physiology opening day using the physiology opening day input key 30.

[0047]According to this example, the seat device with a body fat measurement function which can also display the next physiology scheduled day simultaneously is realized as mentioned above.

[0048]

[Effect of the Invention]Two or more electrodes which the invention indicated to claim 1 provided in the toilet seat and the handrail part, The resistance measurement means which sends current through inter-electrode [said] and measures inter-electrode resistance, The

control means which inputs weight, height, age, sex, and the step numerical value of a pedometer, and the displaying means which displays a measurement result, As composition provided with the calculating means which calculates a body fat value and a consumed calorie from the information on said resistance measurement means and a control means, and displays time progress of said operation value on said displaying means, The impedance of visceral fat is measured and the seat device with a body fat measurement function which can display whether calorie consumption is enough to the present body fat value as a body fat value and time progress of calorie consumption is realized from the information inputted into this impedance and control means.

[0049]The invention indicated to claim 2 reads the counted value of a pedometer only by a control means inserting a pedometer as composition provided with the reading part which reads the counted value of a pedometer, and realizes the seat device with a body fat measurement function it is made to be possible [whose data display].

[0050]The invention indicated to claim 3 realizes the user-friendly seat device with a body fat measurement function which can prevent the dead battery of a pedometer as composition for which the control means prepared the live part which charges a pedometer.

[0051]A toilet seat will be provided with a pressure detection means to generate a voltage signal if a pressure is detected, and the invention indicated to claim 4 considers it as the composition which uses said pressure detection means as the scale, can carry out the automatic meter reading of the weight on that spot, and realizes the seat device with a body fat measurement function which can calculate an exact body fat value.

[0052]In the invention indicated to claim 5, the control means can perform the input of a physiology opening day, and, as for a calculating means, the seat device with a body fat measurement function which the period which was suitable for the diet considering being the optimal period for a diet as composition displayed on a displaying means can also display simultaneously is realized.

[0053]The invention indicated to claim 6 realizes the seat device with a body fat measurement function which can also display the next physiology scheduled day simultaneously as composition as which a calculating means displays the next physiology scheduled day on a displaying means.

[Translation done.]

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TECHNICAL FIELD

[Field of the Invention]This invention relates to the seat device which can measure body fat.

[Translation done.]

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PRIOR ART

[Description of the Prior Art]The conventional body-fat scale has composition which served as the scale, equipped with the electrode the position which places a leg, sent weak current through inter-electrode simultaneously with measurement of body weight, asked for body impedance, and has measured body fat from weight and the value of body impedance. There is also a thing of composition of measuring body fat like the above by grasping the polar zone with both hands.

[Translation done.]

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EFFECT OF THE INVENTION

[Effect of the Invention]Two or more electrodes which the invention indicated to claim 1 provided in the toilet seat and the handrail part, The resistance measurement means which sends current through inter-electrode [said] and measures inter-electrode resistance, The control means which inputs weight, height, age, sex, and the step numerical value of a pedometer, and the displaying means which displays a measurement result, As composition provided with the calculating means which calculates a body fat value and a consumed calorie from the information on said resistance measurement means and a control means, and displays time progress of said operation value on said displaying means, The impedance of visceral fat is measured and the seat device with a body fat measurement function which can display whether calorie consumption is enough to the present body fat value as a body fat value and time progress of calorie consumption is realized from the information inputted into this impedance and control means.
[0049]The invention indicated to claim 2 reads the counted value of a pedometer only by a control means inserting a pedometer as composition provided with the reading part which reads the counted value of a pedometer, and realizes the seat device with a body fat measurement function it is made to be possible [whose data display].
[0050]The invention indicated to claim 3 realizes the user-friendly seat device with a body fat measurement function which can prevent the dead battery of a pedometer as composition for which the control means prepared the live part which charges a pedometer.
[0051]A toilet seat will be provided with a pressure detection means to generate a voltage signal if a pressure is detected, and the invention indicated to claim 4 considers it as the composition which uses said pressure detection means as the scale, can carry out the automatic meter reading of the weight on that spot, and realizes the seat device with a body fat measurement function which can calculate an exact body fat value.
[0052]In the invention indicated to claim 5, the control means can perform the input of a

physiology opening day, and, as for a calculating means, the seat device with a body fat measurement function which the period which was suitable for the diet considering being the optimal period for a diet as composition displayed on a displaying means can also display simultaneously is realized.

[0053]The invention indicated to claim 6 realizes the seat device with a body fat measurement function which can also display the next physiology scheduled day simultaneously as composition as which a calculating means displays the next physiology scheduled day on a displaying means.

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TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention]Moreover said conventional body-fat scale cannot measure impedance of visceral fat, it has the technical problem that accumulation of data cannot be performed.
[0004]That is, in measurement of the impedance between hand-time and effort or a leg-leg, the impedance of visceral fat cannot be measured as described above. The impedance of visceral fat changes easily directly with regards to obesity. Since data is not stored, it remains in the check of being temporary obesity.
[0005]

[Translation done.]

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MEANS

[Means for Solving the Problem]By an electrode provided in a toilet seat and a handrail part, as this invention measures body impedance between femoral regions, it measures impedance of visceral fat, It is considered as a seat device with a body fat measurement function which displays time progress of a body fat value and a consumed calorie from information inputted into this impedance and control means.
[0006]
[Embodiment of the Invention]By the electrode provided in the toilet seat and the handrail part, as the invention indicated to claim 1 measures the body impedance between femoral regions, it measures the impedance of visceral fat, It is being used as the seat device with a body fat measurement function to display with a body fat value and time progress of calorie consumption whether for calorie consumption to be enough from the information inputted into this impedance and control means to the present body fat value.
[0007]The control means is provided with the reading part which reads the counted value of a pedometer, reads the counted value of a pedometer only by inserting a pedometer, and the invention indicated to claim 2 is using it as the seat device with a body fat measurement function it is made to be possible [whose data display].
[0008]A control means is provided with the live part which charges a pedometer, and the invention indicated to claim 3 is using it as the user-friendly seat device with a body fat measurement function which can prevent the dead battery of a pedometer.
[0009]A toilet seat will be provided with a pressure detection means to generate a voltage signal if a pressure is detected, and it can carry out the automatic meter reading of the weight on that spot, and the invention indicated to claim 4 is using it as the seat device with a body fat measurement function which can calculate an exact body fat value.
[0010]The invention indicated to claim 5 is taken as the seat device with a body fat measurement function with which it can also display a period suitable for a diet simultaneously

as a calculating means calculates the optimal period for a diet from the data of a physiology opening day inputted into the control means and makes it display on a displaying means.
[0011]The invention indicated to claim 6 is taken as the seat device with a body fat measurement function with which it can also display the next physiology scheduled day simultaneously as a calculating means calculates the next physiology scheduled day from the data of a physiology opening day inputted into the control means and makes it display on a displaying means.

[Translation done.]

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EXAMPLE

[Example](Example 1) The 1st example of this invention is described below. Drawing 1 is a perspective view showing the composition of this example. The main part 1 and the control means 4 constitute the body fat measurement constant seat device with a function of this example. The main part 1 is provided with the toilet lid 2, the toilet seat 3, the handrail part 6, and the body part 10. Two or more electrodes 7a-7h are formed in said toilet seat 2 and the handrail part 6. Similarly the electrode 7a has prepared the left-hand manual pickpocket the left-hand pickpocket electrode for current impression and the electrode 7b which have been prepared for the left-hand manual pickpocket who constitutes the handrail part 6 by the left-hand pickpocket electrode for potential measurement. The electrode 7c is a right-hand pickpocket electrode for current impression, and, similarly is prepared for the right-hand manual pickpocket. 7 d of electrodes are right-hand pickpocket electrodes for potential measurement, and, similarly are prepared for the right-hand manual pickpocket. The electrode 7e is a left femoral region electrode for impressing current to a femoral region or a hip, and is provided in the left-hand side of the toilet seat 3. 7 f of electrodes are left femoral region electrodes for potential measurement, and, similarly are provided in the left-hand side of the toilet seat 3. 7 g of electrodes are right femoral region electrodes for current impression, and are provided in the right-hand side of the toilet seat 3. 7 h of electrodes are right femoral region electrodes for potential measurement, and are provided in the right-hand side of the toilet seat 3. The heater for the body part 10 to manufacture warm water inside and the microcomputer (henceforth a microcomputer) for directing a washing start etc. are accommodated. The facilities lid 2 can be taken up and down now if needed. The handrail part 6 is an auxiliary means for sitting down easily, when raising the toilet lid 2 and sitting down on the toilet seat 3.
[0013]The control means 4 has the appearance shown in drawing 2. That is, it has the backspace key 20d and the displaying means 5 which displays a measurement result and to display as well as the input key 20a which inputs weight, height, age, sex, and the step

numerical value of a pedometer, the individual set key 20b for carrying out setting out according to individual, and FWD key 20c which performs graph operation.

[0014]The information set as said input key 20a, the individual set key 20b, FWD key 20c, and the backspace key 20d is transmitted to the microcomputer 18 built in said body part 10. The resistance measurement means which measures resistance from the current which the microcomputer 18 supplies voltage in said electrode 7a-7h, and flows into inter-electrode, A body fat value and calorie consumption were calculated from said resistance measurement means, said input key 20a, and the information that was inputted by the individual set key 20b, or was set up, and it has the calculating means which displays time progress of an operation value on the displaying means 5.

[0015]Drawing 3 is a block diagram explaining the composition of said calculating means and a resistance measurement means. The electrode changeover section 12, the constant current generation circuit 13, the difference circuit 16, and A/D converter 17 constitute the resistance measurement means 8. The electrode changeover section 12 has a function which switches the electrode for current impression, and the electrode for potential measurement. The constant current generation circuit 13 has the function to send fixed current through each electrode for current impression. The difference circuit 16 has a function which outputs the signal equivalent to the potential difference of the voltage supplied to the positive electrode, and the voltage supplied to the negative terminal. Since the constant current generation circuit 13 is made into the current source at this time as described above, said potential difference is decided by impedance of a human body, and the difference circuit 16 acts after all so that the impedance of a human body may be measured. A/D converter 17 is connected to the output of said difference circuit 16.

The A/D conversion of the measured value which shows the impedance of a human body is carried out, and it is outputting to the microcomputer 18.

The reference resistance 14 and the reference resistance 15 are connected to the electrode changeover section 12. The reference resistance 14 and the reference resistance 15 have a function in which said current regulator circuit 13 proofreads the quantity changed under the influence of ambient air temperature or disturbance.

[0016]The microcomputer 18 and the memory 19 constitute the calculating means 9. The microcomputer 18 calculates body fat from the signal which shows the impedance of the human body which is an output of said resistance measurement means 8, and has the calorie consumption for returning said body fat to a different standard value for every sex from age and weight as a control program.

[0017](Table 1) shows the relation of the impedance of a human body and amount of body fat which artificers investigated.

[0018]

[Table 1]

性別	定 数	１０～１６才	１７才	１８～６０才
男性	Ｋ１	−30.0878	−22.5104	−14.2452
	Ｋ２	0.4432	0.3766	0.29999
	Ｋ３	24.8318	24.5418	19.2507
	Ｋ４	0.0008447	0.0008208	0.0008184
	Ｋ５	0	0	−0.08941
女性	Ｋ１	−12.1173	−9.9727	−0.61143
	Ｋ２	0.34953	0.30037	0.25065
	Ｋ３	13.5013	10.9716	8.4344
	Ｋ４	0.0006947	0.0006919	0.0006897
	Ｋ５	0	0	−0.06741

注：定数　Ｋ１は切片に対するもの
Ｋ２は体重（ｋｇ）に対するもの
Ｋ３はインピーダンスに対するもの
Ｋ４は身長（ｃｍ）×身長（ｃｍ）／インピーダンスに対するもの
Ｋ５は年齢に対するもの

[0019]this (Table 1) -- the shown coefficient K1, K2, K3, K4, and K5 are determined by sex, age, weight, and height. Amount of body fat uses the coefficient K1, K2, K3, K4, and K5, and is calculated by the formula shown in (several 1) and (several 2).

[0020]

Fat-free-mass =K1+K2xW+K3xZ+K4xLxL/Z+K5xA W: Weight, L:height, Z:impedance, A:age (several 1)

amount-of-body-fat = weight-fat-free mass (several 2)

Hereafter, operation of this example is explained. He sits down the handrail part 6 on the toilet seat 3 using assistance, a user opening the toilet lid 2 and taking down handrail part 6 **, and performs elimination action. If it sits down on the toilet seat 3, a user's hip or femoral region will contact the electrode 7e, 7 f of electrodes, 7 g of electrodes, and 7 h of electrodes. A user's both arms contact the electrode 7a, the electrode 7b, the electrode 7c, and 7 d of electrodes. If the body fat key 20e provided in the control means 4 is pressed at the time of this elimination action, the microcomputer 18 will start the measuring work of a body fat percentage.

[0021]That is, the square wave pulses whose microcomputer 18 is 50 kHz are outputted, the constant current generation circuit 13 acts, these square wave pulses are made into a sine wave by passing a filter, and the 50-kHz constant current of 800uA is generated. It is determined through which electrode whose electrode switching parts 12 are the electrodes 7a-7h the signal of the microcomputer 18 is transmitted to the electrode switching part 12, and sends current. While uses the four probe method which contact resistance can disregard, and

measurement of impedance inter-electrode [each] sends current through an electrode, and measures the potential of another [which is said electrode and a pair] electrode. Inputting the inter-electrode potential of each set into the difference circuit 16, the difference circuit 16 searches for the inter-electrode potential difference V. The signal which shows this potential difference V is changed into a digital signal by A/D converter 17, and is transmitted to the microcomputer 18. The microcomputer 18 asks for inter-electrode impedance, i.e., the impedance of a human body, with said digital signal.

[0022]Impedance at this time Although it asks as Z=I/V (I: constant current, V:potential difference), since the constant current I is what receives the influence by temperature, etc., it is asking for Z by this example using the formula shown in (several 3).

[0023]

Z=KixT+Ko (Ki: a constant, Ko:constant) Said (several 3) Ki and Ko have stable resistance, and are calculated using the reference resistance R1 (14) and the reference resistance R2 (15) which are known. In this way, at this example, it is asking for the impedance Z by the formula shown in (several 4).

[0024]

Z=(R1-R2) (/(V1-V2)) x(V1xR2-V2xR1)/(V1-V2) (several 4)

Next, an operation of the electrode switching part 12 is explained. There are six kinds of measuring modes of the electrode 7a - 7 h of electrodes. That is, as for the mode 2, as for the mode 4, the mode 6 of the mode 5 is [the mode 1 / the mode 3] between right hip-left hips between left-hand-right hips between right-hand-left hips between right-hand-left hands between the reference resistance R2 between the reference resistance R1. The microcomputer 18 sends a signal to the electrode switching part 12, switches said six kinds of measuring modes in order at intervals of 100 ms, and measures inter-electrode impedance.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1]The perspective view showing the composition of the seat device with a body fat measurement function which is the 1st example of this invention
[Drawing 2]The top view showing the appearance of a **** control means
[Drawing 3]The block diagram explaining the composition of a **** calculating means and a resistance measurement means
[Drawing 4]The explanatory view showing the display of a **** displaying means
[Drawing 5]The mimetic diagram showing the impedance of a **** human body
[Drawing 6]The perspective view showing the appearance of the control means currently used for the seat device with a body fat measurement function which is the 2nd example of this invention
[Drawing 7]The perspective view showing the appearance of a **** pedometer
[Drawing 8]The perspective view showing the composition of the seat device with a body fat measurement function which is the 4th example of this invention
[Drawing 9]The characteristic figure showing the characteristic of a **** pressure sensor
[Drawing 10]The block diagram explaining the composition of a **** calculating means and a resistance measurement means
[Drawing 11]The top view showing the appearance of the control means currently used for the seat device with a body fat measurement function which is the 5th example of this invention
[Drawing 12]The top view showing the appearance of the control means currently used for the seat device with a body fat measurement function which is the 6th example of this invention
[Description of Notations]
1 Main part
2 Facilities lid
3 Toilet seat

4 Control means
5 Displaying means
6 Handrail part
7a The left-hand pickpocket electrode for current impression
7b The left-hand pickpocket electrode for potential measurement
7c The right-hand pickpocket electrode for current impression
7 d Right-hand pickpocket electrode for potential measurement
7e The left femoral region electrode for current impression
7 f Left femoral region electrode for potential measurement
7 g Right femoral region electrode for current impression
7 h Right femoral region electrode for potential measurement
8 Resistance measurement means
9 Calculating means
12 Electrode switching part
13 Constant current generation circuit
14 Reference resistance
15 Reference resistance
16 Difference circuit
17 A/D converter
18 Microcomputer
19 Memory
21 Pedometer
25 Reading part
28 Pressure sensor
30 Physiology opening day input key
31 Diet mark
32 Next physiology scheduled day pilot wire

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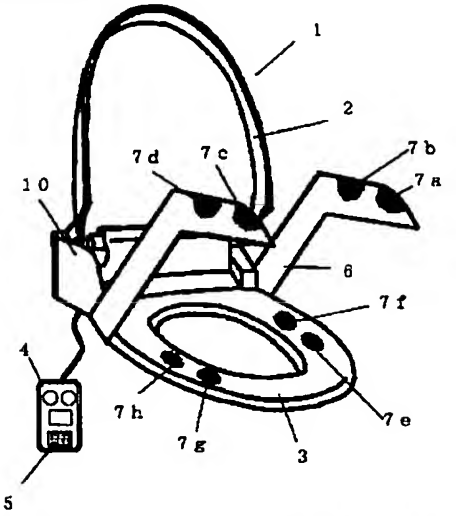
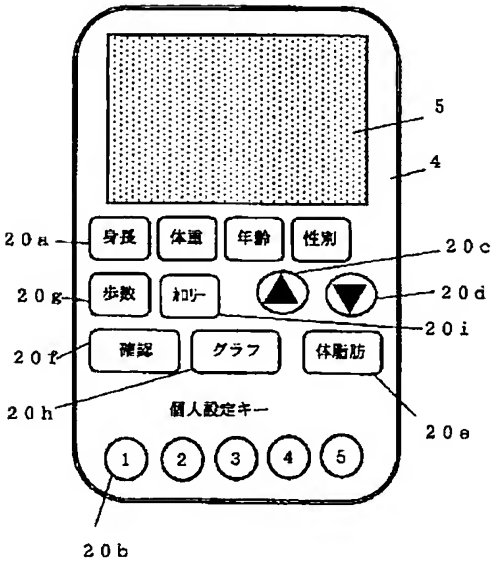
DRAWINGS

[Drawing 1]



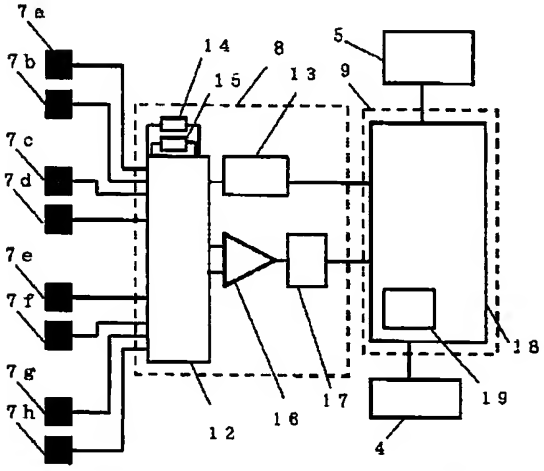
1	本体	7b	電位測定用左手すり電極
2	便ふた	7c	電流印加用右手すり電極
3	便座	7d	電位測定用右手すり電極
4	操作手段	7e	電流印加用左大腿部電極
5	表示手段	7f	電位測定用左大腿部電極
6	手すり部	7g	電流印加用右大腿部電極
7a	電流印加用左手すり電極	7h	電位測定用右大腿部電極
		10	本体部

[Drawing 2]



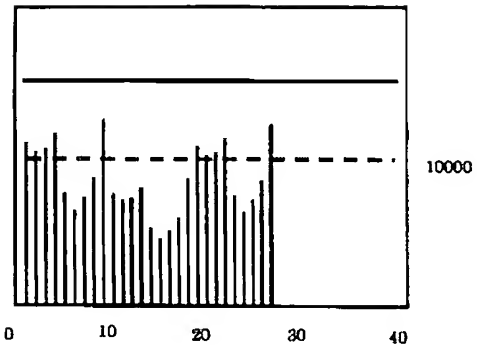
4 操作手段	20e 体脂肪測定用キー
5 表示手段	20f 確認キー
20a 入力キー	20g 歩数キー
20b 個人設定キー	20h グラフキー
20c 前進キー	20i カロリーキー
20d 後退キー	

[Drawing 3]

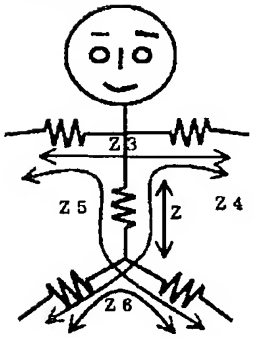


4 操作手段	8 抵抗値計測手段
5 表示手段	9 演算手段
7a 電流印加用左手すり電極	12 電極切替部
7b 電位測定用左手すり電極	13 定電流発生回路
7c 電流印加用右手すり電極	14 基準抵抗R1
7d 電位測定用右手すり電極	15 基準抵抗R2
7e 電流印加用左臀部電極	16 差分回路
7f 電位測定用左臀部電極	17 A／Dコンバータ
7g 電流印加用右臀部電極	18 マイコン
7h 電位測定用右臀部電極	19 メモリ

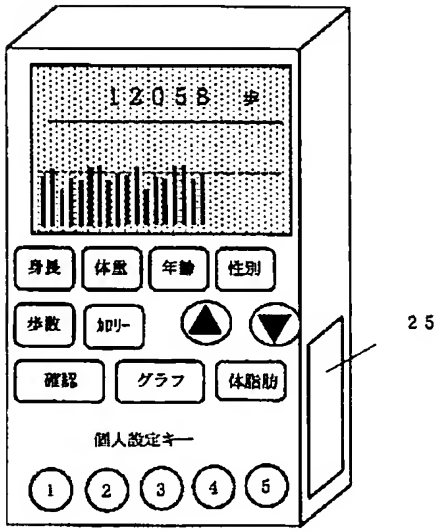
[Drawing 4]



[Drawing 5]

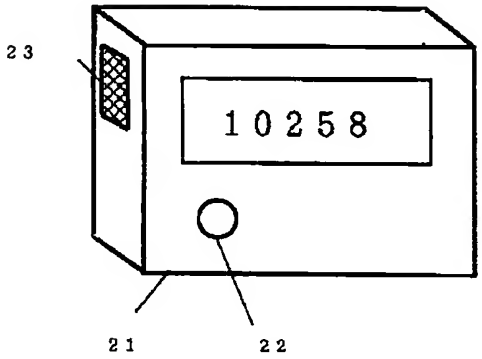


[Drawing 6]



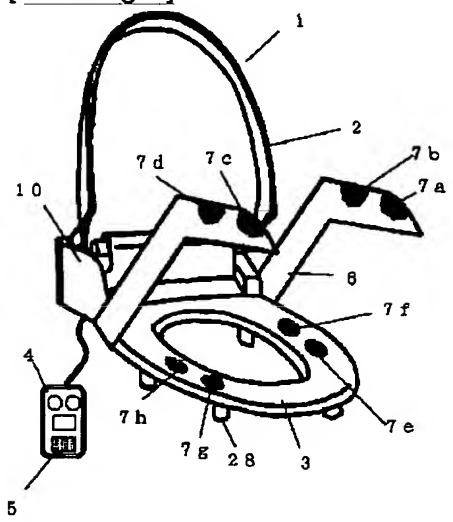
25 読み取り部

[Drawing 7]



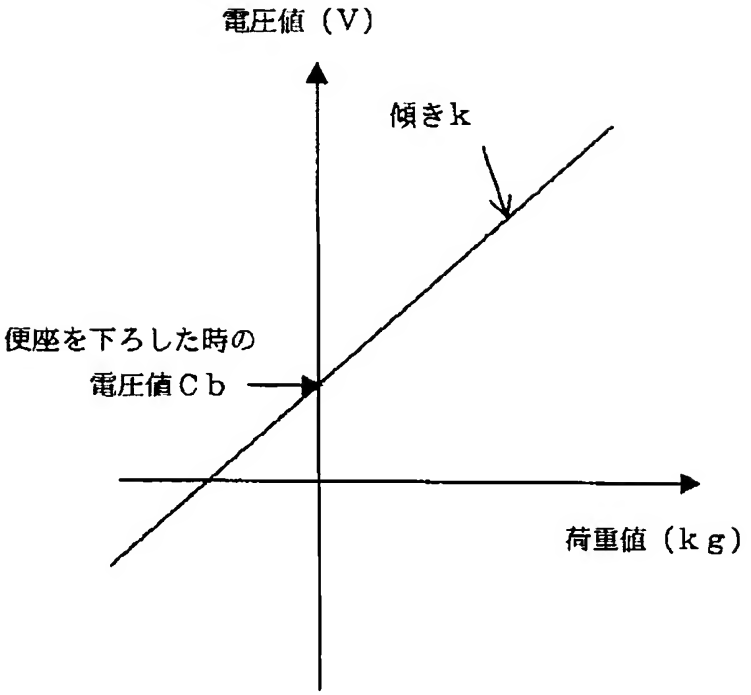
21 歩数計
22 リセットボタン
23 電極

[Drawing 8]

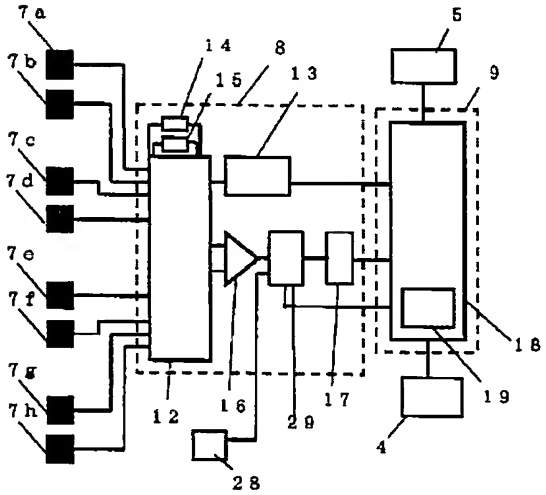


3 便座
28 圧力センサ

[Drawing 9]

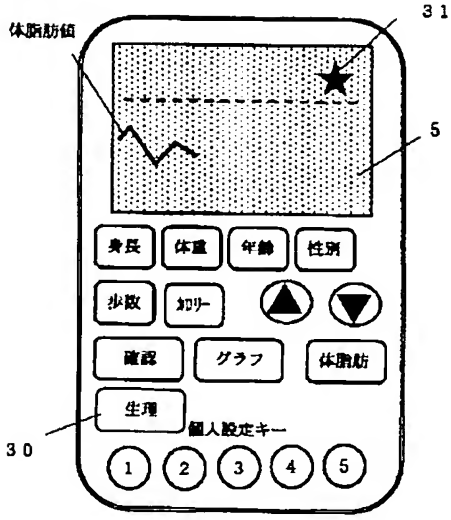


[Drawing 10]



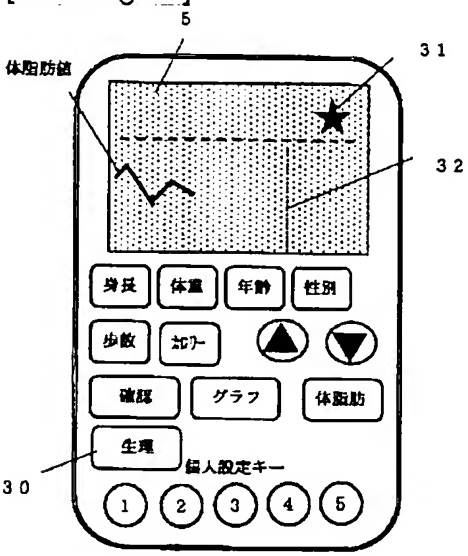
28 圧力センサ
29 体重体脂肪出力切替部

[Drawing 11]



5 表示手段
30 生理日開始入力キー
31 ダイエットマーク

[Drawing 12]



5 表示手段
30 生理日開始入力キー
31 ダイエットマーク
32 次回生理予定日表示線

[Translation done.]